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## **"Context-Graded Referential Logic"**

A concise formal summary

## Context-Graded Referential Logic

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# "Context-Graded Referential Logic"

A concise formal summary

## 1. Basic Definitions

Primitive entities:

- $W_0$ : current world (actual context).
- $W'$ : alternative world (possible but non-existent in  $W_0$ ).
- $k \in [0, 1]$ : distortion degree (0 = truth in  $W'$ , 1 — complete falsehood).

Operators:

- $True(\phi)$ :  $\phi$  is true in  $W_0$ .
- $Distort(\phi, k, W')$ :  $\phi$  is true in  $W'$  with distortion degree  $k$ .

## 2. Axioms

a). Graded Distortion:

In  $W_0$  the statement  $Distort(\phi, k, W')$  transforms into:

$$True_k(\phi) = \begin{cases} \phi, & \text{if } k=0 \text{ (truth in } W'), \\ \perp_0, & \text{if } k=1 \text{ (complete falsehood),} \\ \sim\phi(1-k), & \text{if } 0 < k < 1 \text{ (graded uncertainty),} \end{cases}$$

where:

$\perp_0$  — falsehood marker (analogous to  $\emptyset$  but preserving the assertion's existence) enables the recording of false statements for analysis, allows safe execution of logical operations, and clearly separates intentional lies from technical errors (Error),

- Technically equivalent to 0 in Boolean algebra
- Distinct from classical  $\perp$  (contradiction)
- Properties:

- $\perp_0 \wedge \phi = \perp_0$
- $\perp_0 \vee \phi = \phi$
- $\neg \perp_0 = True$

$\sim\phi(1-k)$  — a fuzzy/probabilistic form of  $\phi$  with confidence degree  $(1-k)$ .

Example:  $\sim\phi(0.3)$  = Possibly  $\phi$  (70% confidence).

Formally: a modal operator with probabilistic evaluation.

## b). Referential Collapse:

If  $W'$  does not exist,  $\text{Distort}(\phi, k, W')$  transforms into  $\perp_0$  (falsehood marker) when  $k > 0$ :

$$\text{Distort}(\phi, k, W') \rightarrow \perp_0.$$

At  $k=0$  (if  $\phi$  should be true in non-existent  $W'$ ) — the statement also yields  $\perp_0$ , since reference to a non-existent context is invalid.

Impossibility Criterion for  $W'$ :

- $\phi$  references itself,
- $\phi$  contains infinite evaluation recursion.

For self-referential statements (e.g., the Liar Paradox),  $W'$  is defined as non-existent (for any  $k$ ).

## 3. Examples

$$\text{Distort}('The\ cat\ is\ on\ the\ mat', 0.3, W') \rightarrow in\ W_0: 'The\ cat\ is\ possibly\ (70\% \ confidence)\ on\ the\ mat'$$

$$\text{Distort}('I\ am\ lying', 0.5, W') \rightarrow in\ W_0: \perp_0$$

## 4. Advantages

- Paradox Resolution: Self-referential statements are marked as false, preserving the system's consistency.
- Graded Truthfulness: The parameter  $k$  explicitly quantifies distortion degree — from complete truth ( $k=0$ ) to absolute falsehood ( $k=1$ ).
- Model Flexibility: Requires no ad-hoc prohibitions or complex hierarchies, relying instead on intuitive notions of reference and context.
- Falsehood Tracking: The  $\perp_0$  marker explicitly records false statements, enabling analysis of their sources and frequency patterns.

## 5. Conclusion

Context-Graded Referential Logic offers a balanced approach that combines the rigor of a formal system with the flexibility of the real world. Here, falsehood is not a destroyer of logic but its natural counterpart: it exists in alternative contexts ( $W'$ ) as a "shadow" of truth and is clearly marked by the system ( $\perp_0$ ), even in paradoxical cases. The model maintains intuitive clarity while avoiding classical contradictions.